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ABSTRACT

Based on needs expressed by representatives from many Wisconsin school districts, this publication presents guidelines for introducing, enhancing, and evaluating the use of computer technology in schools. The first chapter provides a brief overview of the impact of computers on education and a list of principles for promoting their use in schools. In the second chapter a model for computer use in education is presented, with guidelines for teaching about computers and programing, for computer assisted instruction (CAI), and for computer managed instruction and the utilization of computers in educational administration. Planning for the introduction of computers in K-12 instruction is generally outlined in the third chapter, while the fourth chapter describes the process for implementing a district plan, including guidelines for staff development; software and hardware selection, acquisition, and management; compliance with copyright legislation; and curriculum planning and development. A chart suggesting the scope and sequence of computer education is included, with an indication of possible grade spans for introductory, developmental, and review activities. A check list for assessing the implementation of computer education programs is also provided, and the final chapter presents a series of questions for use in developing a mode for evaluating the program model. Appendices include a list of sources to contact for further information, a summary of computer equity issues, sample courseware and hardware evaluation forms, and a position paper on the need for and methods of providing instruction in keyboarding. (ESR)

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1983-84

WISCONSIN GUIDELINES

FOR INSTRUCTIONAL COMPUTER USE IN EDUCATION

K-12

STATE OF WISCONSIN
DEPARTMENT OF PUBLIC INSTRUCTION

August 1983

WORKING DRAFT

Herbert J. Grover
State Superintendent

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PREFACE

Educators at local, regional, and state levels are making decisions daily about advancing the use of computer technology in the schools. They have an immediate need for information that provides perspectives and useful alternatives concerning the roles of computers in education.

This working draft represents the first step in the development, field testing, and revision of the guide. The committee believes that this rapidly changing area of study requires that provision be made to accommodate comments and suggestions from interested educators, particularly as such comments may help refine and extend the guidelines which are presented, and aid the development of future related curricular materials. For example, the committee agreed that this guide, based on needs expressed by representatives from many Wisconsin school districts, provides a basic model for dealing with a pervasive new technology at the local level. However, it also recognizes the need for supplemental monographs on the use of computers in the various subject areas, aids for teachers in using the computer as a teaching tool, the development of teaching units and activities to accompany the various elements of the Computer Education Model, and any other suggestions by interested educators.

This guide is intended to supplement a series of curriculum documents relating to the academic, humanities, and vocational areas of study planned by the Department of Public Instruction for the period 1983-85. It is also intended to support districts which are developing their own computer curriculum. The working draft will be revised and published during 1984. Short supplemental monographs will be developed and published in six- to eight-month intervals as needs and priorities in local school districts are identified, and to reflect the state of the art in computer education.

It is appropriate at this time to acknowledge and thank members of the Computer Education Subcommittee for the time, support, and assistance they provided in producing the Computers in Education Model and this guide:

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We would also like to acknowledge the work of many school districts in the state, in particular Owen-Withee, Mequon-Thiensville, Lake Mills, Appleton, and Prairie du Chien, which helped in the development of this document.

CHAPTER I - PERSPECTIVES

A revolution in communications and information technology is making the computer a basic tool for acquiring knowledge, organizing systems, and solving problems. As such, it is having a profound influence on learning and on the world of work.

The Computers in Education Committee wholeheartedly supports and recommends that all disciplines within the public schools of Wisconsin answer to the challenge presented and begin using the contemporary tools of technology, specifically the computer, as an integral part of all instructional programs. The content of this guide will define and detail the use of computers in education, and provide a sound base to accomplish the integration of computer technology within all disciplines.

Historical developments

The world as we know it has changed more in the past 200 years than it has throughout all previous history. This change is continuing at an ever accelerating pace and increasing magnitude. As stated by futurist Alvin Toffler, this accelerated pace is pushing society out of the industrial age and into an information age, which Toffler labels "The Third Wave:"

> The Third Wave brings with it a genuinely new way of life based on diversified, renewable energy sources; on methods of production that make most factory assembly lines obsolete; on new, non-nuclear families; on a novel institution that might be called the "electric cottage"; and on radically changed schools and corporations of the future. The emergent civilization writes a new code of behavior for us and carries us beyond standardization, synchronization, and centralization, beyond the concentration of energy, money and power. (Toffler, The Third Wave, p.26)

Dominant in the "new industry" are the technological developments of computers, lasers, robots, computer-aided design and computer-aided manufacturing (CAD/CAM), new materials, new processes, new techniques, and communication systems.

Impact of computers on education

In the immediate future, most workers either will work directly with computers or have their work influenced by computers in some significant manner. This influence demands an informed citizenry that not only understands what computers can and cannot do but also is aware of the problems and issues involved in their use.

Knowledge of the computer is basic to an understanding of the full range of procedures that may be applied to organizing information and solving problems in fields as diverse as mathematics, science, the social sciences, business, industry, language, and the arts. Integrating computers into the school curriculum can expand educational opportunities for all students. However, without particular attention to equity issues the computer revolution has the potential to widen the gap between advantaged and disadvantaged, male and female, majority and minority students. It is the commitment of this committee, and of the Department of Public Instruction, to prevent this from occurring. To that end, we have included checklist items for evaluating software

that address equity issues, as well as an article in the appendix that helps educators be aware of how pervasive their concern for equity must be. (See Appendix B)

Education and society have many important decisions to make at the present time and in the near future. To paraphrase Burnham in The Rise of the Computer State,

> Do we build a society like that of classical Greece, where the Slaves --in our case the computer--allow us to focus our thinking on philosophy, art, and literature. Or do we build an Orwellian state, where we become dependent upon technology and the people who run it. A great deal is at stake in this choice, and we have to be very careful.

This guide presents Wisconsin's point of view and a plan for helping educators incorporate computers into the local school curriculum. The committee believes that all four components of the Computers in Education Model: (1) the history, social impacts, and future trends, (2) computer concepts and operations, (3) problem solving and applications, and (4) programming are essential to contemporary computer education for Wisconsin students. Upon completion of a computer education program, all students should be comfortable, confident, and knowledgeable about computers as they affect our lives. In addition, some students will achieve both a working knowledge of the more complex computer languages and some skill in computer programming. Furthermore, the model presents a plan for the coordinated management of computers in local districts by addressing computer-aided learning and management information systems, particularly those applicable to school operations.

Knowledge of the computer and its application is a basic skill in contemporary education. Each student should acquire an understanding of the versatility and limitations of the computer through firsthand experiences with applications in a variety of fields. Curricula should be designed to take full advantage of the multidisciplinary potential of the computer.

The committee, which includes educators with considerable experience in educational computing, have agreed that the following principles are inherent in the effective implementation of the use of computers in schools.

A. Principles

Computer use in the schools should be based on the following principles:

1. Computers should be introduced into the curriculum with an orderly and well-defined plan.

2. Students of all ability levels, genders, races, handicaps, and ethnic groups can and must use computers.

3. All classroom teachers are capable of using the computer as an instructional tool. Adequate staff development programs must be provided to ensure the effective use of computers in education.

4. Computers should be made available in sufficient numbers so that students will have an adequate opportunity to develop basic computer

operational skills and to feel comfortable using the computer as a learning and problem-solving tool.

5. Computers should be considered as superior instructional tools in some situations and inferior in others. The versatility of computers allows them to provide instructional support in all disciplines.

6. Computers should support instructional management through success prediction, monitoring student progress, vocational guidance, and education and career planning.

7. Districts should make a commitment to computer education as a basic skill for all students.

8. Computers will allow teachers to concentrate on student needs and learning problems, and to become more effective facilitators of learning.

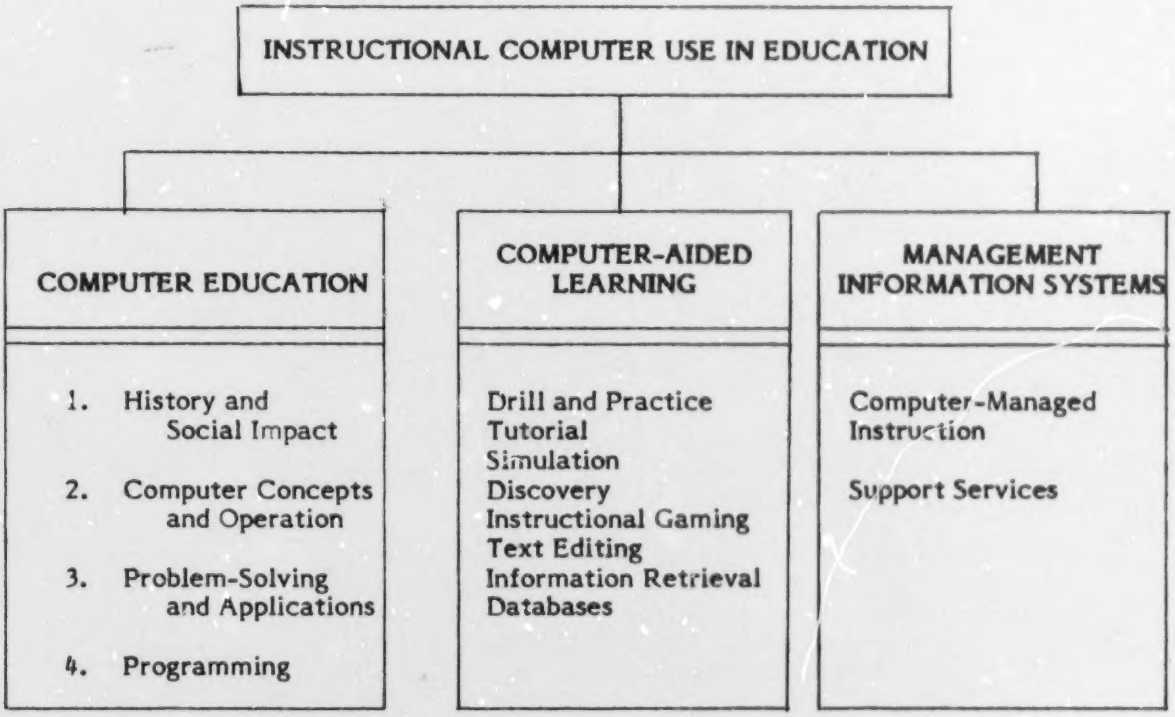
9. Implementation of an effective computer plan requires sufficient district resources to support staff, curriculum, and faculty development.

10. The rapidly evolving nature of information technology demands constant awareness and revision of current practice to realize the computer's potential as a learning tool.

Consideration of these principles for promoting the use of computers in schools led the committee to develop the model introduced in Chapter 2. It is important to note that this model represents a timely outline of components recognized by many computing educators as essential. We believe that these principles are inherent in the successful implementation of computer use in schools.

CHAPTER 2 - MODEL FOR COMPUTER USE IN EDUCATION

This model is intended to help educators deal with the use of computers in education in three ways: (1) to teach computer as a subject of instruction, (2) to use the computer as a tool in teaching the school curriculum, and (3) to aid in the management of instruction.



A. COMPUTER EDUCATION

1. History and Social Impact

- The history of computers and why they exist
- How computers affect people's lives; what people think of computers and what computers can and cannot do for people
- Computers and related careers; where do we fit into the computer picture
- The value of information in society -- social, legal, educational implications, ethical issues
- Implications for the future:
  - Artificial intelligence
  - Robotics

- Misuse of computers

2. **Computer Concepts and Operations**

   - What is a computer - terminology and definitions
   - How do computers work - including capabilities and limitations, components and their functions, hardware and software
   - Hands on experience
     - Using the keyboard
     - Inputting, outputting and saving data
     - Sound and graphics
     - Executing programs

3. **Problem-Solving and Applications**

   - Identify and formulate a problem, select and use appropriate software to solve the problem
   - Use computer generated data in decision making
   - Use and apply software tools such as database programs, word processing, electronic spread sheets, and information retrieval

4. **Programming**

   - Using programmable devices
   - Algorithms and flow charting
   - Computer programming (BASIC, LOGO, PASCAL, COBOL, etc.)
   - Computer systems; systems designs and design logic

B. **Computer-aided learning** provides an opportunity to use computer programs as effective instructional tools in the same way other media is used. The computer becomes a tool of instruction in many areas of the curriculum for drill and practice, inquiry, problem-solving, and as a tutor for remediation, initial teaching, enrichment and learning reinforcement. Well-developed computer software can offer dynamic and interactive versatility to the learning process.

Drill and Practice - reviewing, reinforcing concepts or skills that have already been taught.

Tutorial - programs that introduce, explain concepts and facts; may provide an initial exposure to the materials.

Simulation - programs designed to model real world environments with which students can investigate areas of mathematics, social studies, ecology, physics, chemistry, etc. Simulations allow students to make decisions and interact in situations that are often too complex, historical, expensive, dangerous, or distant to be brought into the classroom.

Discovery - computer programs used to develop cognitive abilities in problem solving and in specific subject areas, such as math, language arts, social studies, etc.

Instructional Gaming - games designed to hold a user's attention and interest while teaching skills of logical thinking or to make practice less tedious.

Text Editing - use of word processing software in language arts or other disciplines to promote better and more creative writing skills.

Information Retrieval - use of the computer as a tool to manipulate and search on-line systems for information; electronic mail and electronic bulletin boards.

Databases - use of the computer to collect, find, sort, and display data.

The way the computer is used in the educational setting is determined by the amount of hardware available, the type of software used, and the district philosophy. There are various techniques for using computers in the curriculum that may be considered. It should be noted that the size of the groups that can effectively work on one computer simultaneously depends on the program being used and the desired objectives. Groups of three or four students may be very productive if the program is designed for active involvement by all participants. If the program is designed for one or two students, it is important that the other students remain involved in other learning activities while they wait for their turn on the computer.

Modes of Instruction

Individual

The computer is used as a supplement to a regular classroom program with enrichment or remedial work. Students are assigned computer programs which fit their achievement levels after the material has been presented to the entire class. This mode is an excellent way to meet individual needs but does require software that can be used at many different levels.

Large group mode

The computer is used as a demonstration or class discussion tool. These allow the introduction of special topics and give the teacher the ability to control the input in a demonstration to achieve an objective and to make certain that all significant points are covered.

Small group mode

The computer is used as an integral part of daily classroom presentation. The instruction for the day may include the use of a particular computer program by students with a set educational objective. Students in small groups may cooperate in the decision-making process or the program may be used on an individual basis.

In computer-aided learning applications, the computer does not dictate the curriculum. Computers do certain things well and fit into established curricula. Educators should determine their curriculum first and then consider how computers fit into the instructional objective and activities of that curriculum.

C. **Management Information Systems** - the computer is used as a manager of instruction and of the educational setting.

Computer-Managed Instruction (CMI). The computer offers the teacher a means to give special and individual help to students and a diagnosis and prescription system that is easily administered.

CMI software contains a range of components usually including record keeping, grouping, diagnosis and prescription. CMI may or may not use the computer for the student's instructional ability. Many CMI packages prescribe assignments in basal tests, workbooks, etc.

Support Services - a district might look for software which will enable staff members to alleviate time-consuming record keeping and organizational tasks. A computer can also provide access to online information databases and electronic mail through telephone connections.

Examples of these various types of applications include:

- student record keeping
- individualized educational plan (IEP)
- test generation, grading, and analysis
- word processing
- electronic bulletin boards
- information retrieval
- student assessment

CHAPTER 3 - PLANNING FOR INTRODUCING COMPUTERS IN K-12 INSTRUCTION

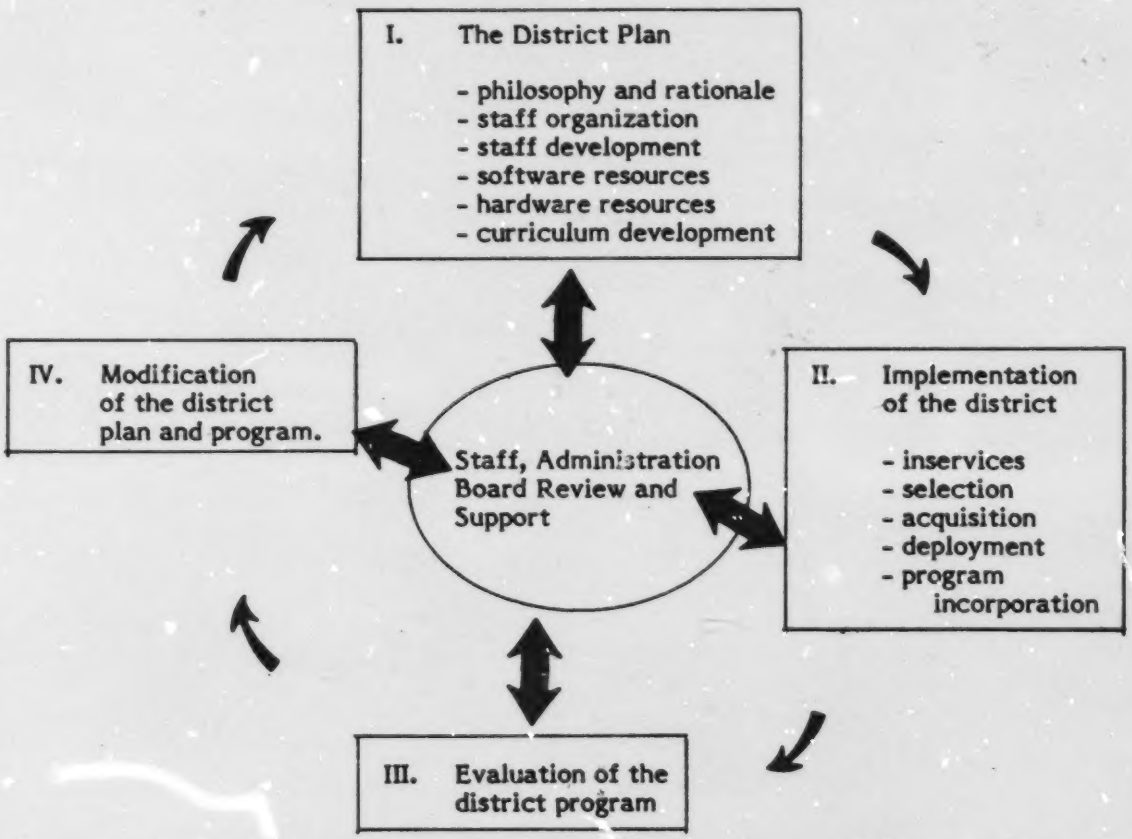
The considerations included in this section are intended to help educators deal with computer education in three ways: (1) to use the computer as a tool to help teach the school curriculum, (2) to teach about the computer as a subject of instruction, and (3) to allow and encourage curriculum change and development.

District decisions for the use of computers in education should be based on a carefully written plan. The plan should address:

- district use of the computer as an instructional tool;
- the curriculum for the computer as the subject of instruction;
- organization of district resources to implement computer education, K-12.

The district plan for computer education should facilitate and insure shared decision making in administrative action, the instructional plan, curriculum implementation, and evaluation.

INTRODUCING COMPUTERS INTO THE K-12 CURRICULUM



To provide computing instruction in an effective manner requires the development of a plan directed at specific changes and improvements. The plan's success will depend largely on two factors:

- Administrative organization and support for change.
- Existing attitudes, values, and priorities that together comprise the climate for change.

If computer education is to be implemented effectively, there must be a mechanism for establishing authority, for obtaining instructional materials and equipment, for acquiring services, and for making decisions. If this mechanism does not exist, it will have to be created. Curriculum development and implementation, if they are to be successful, require this network of administrative support.

1. **Responsibility for Coordination**

   A first requirement is for the school administration to designate an individual who will carry the major responsibility for the district-wide planning and coordination for computer education. Ideally, this person should be well-trained and experienced in educational computing and curriculum planning and development. It is important for the coordination role to be delegated to someone who possesses skills in organization and whose leadership is accepted by the staff.

   The person assigned as district computer coordinator must have delegated authority as well as responsibility. This includes authority to call and conduct meetings, communicate freely with staff members, train staff members, and manage facilities.

2. **Instructional Computing Committee**

   a. Structure of the committee

      Curriculum planning is a complex task which should not be vested in one individual regardless of personal qualifications. A second step is to appoint an instructional computing committee which will be needed to coordinate the plan. The designated district computer coordinator should be assigned to act as chair of the committee and to serve as a liaison person within the district.

      The instructional computing committee should be broadly representative of all groups which will be affected by the curriculum change; it may include representatives from each building, each grade level, administration, board of education, community, and the student body. It is also important to include both genders, representative races, and ethnic groups to help assure equal access to computers across the district.

      The members of the committee may be selected from individuals who demonstrate:

- the ability and willingness to implement instructional computing kindergarten through grade 12
- knowledge or interest in computers
- willingness to help provide a leadership role in the district as well as at the building level
- willingness to deal with philosophical and ethical issues, including equity issues

Committee members should be appointed for a term long enough to insure continuity, with provision for new personnel to be appointed periodically.

b. Operational procedures

Computer program assignments and responsibilities require time. The committee members who are appointed need district-supported time to initiate and implement activities related to the program. In addition, in such a quickly expanding field, the district coordinator must have time for professional growth--for either visitations to other programs, conference attendance, or participation in continuing education experiences and training.

c. Committee responsibilities

The tasks of the Computer Education Committee might include:

- formulating a district plan for integrating computers into the curriculum
- developing a K-12 district computer education curriculum
- implementing a computer training program for teachers, principals, and administrators
- developing implementation plans
- coordinating equipment use throughout the district
- making budget recommendations
- developing a process for revising the district plan and implementation procedures as needed
- writing computer hardware and software acquisition, copy, and management policies
- developing guidelines for access, i.e., use of computer hardware and software both on and off premises

- reviewing and recommending appropriate articulation in curriculum proposals from other disciplines

- setting long-term as well as yearly goals

- informing the community about the program

3. **Philosophy and Rationale**

Implementation of technology must be a gradual process. Planning for the use of computers to help teach the curriculum must include some allowance for a phased implementation of the plan and some carefully considered time lines for teacher training. The resistance to change in education has been thoroughly documented in the research. This is especially important to consider in the use of technology because we tend to teach as we have been taught. Few teachers among the current generation have the background of experience to fully use technology without some assistance.

Working with a selected group of people first, rather than with a total district, has many advantages. If a core group can be made to feel completely comfortable with the computer, or other technology, they will serve as excellent role models for other teachers. Further, if these key people are part of the planning process, they will feel a greater sense of ownership. Upon this initially trained group rests much of the responsiblity for eventual implementation by the rest of the faculty.

Limited budgets for the acquisition of hardware and software also speak to the need for gradual implementation. The degree of implementation will be determined by the number of computers available and the level of trained staff. Also, because technology will be constantly changing while this implementation process is going on, the plan must be flexible enough to adapt to necessary changes.

a. Needs

Identifying district needs is the first step in developing a comprehensive instructional computer implementation plan. The information gathered from assessing the present provides the essential background data for developing a computer education plan.

Although there are many areas to be examined in the initial assessment process, some of the most pertinent questions that may require exploration include these:

- Has the board of education and administration recognized the need to incorporate computers into the education setting?

  Any assessment procedures will prove fruitless unless boards of education and administrators have expressed support.

- Has the teaching staff indicated an interest in or willingness to learn about instructional use of computers?

Some indicators of teacher interest may be gleaned through:

- teacher surveys
- teacher-principal discussions
- teacher attendance at computer workshops, seminars, etc.
- teacher enrollment in computer courses

- Could students' educational needs be better met or learning opportunities enhanced through computer use?

  Knowledge of student achievement strengths and weaknesses as found through both formal and informal assessment procedures can be very helpful in determining areas in which computers might be beneficial.

- What is the status of the current curriculum?

  Examining the current curriculum is essential in determining where computers could be an asset in the instructional process.

- Are there resources available for computer implementation?

  Implementing instructional computing costs money and takes time. The scope and speed of computer implementation will be greatly influenced by the availability of resources.

- Have parents and community expressed the need for the school district to become involved in computer use?

  Parents and community members will be supportive of what they perceive to be educationally important.

- What does the literature and research say about implementing computers in the educational setting?

  No implementation plan should be formulated without reviewing current literature and significant research.

b. Goals

District-wide goals are statements of general purpose and intent to foster educational excellence. The goals for instructional computer use should provide guidance and direction in at least the following areas:

- philosophy and rationale
- staff organization
- staff development
- hardware resources
- software resources
- curriculum development

The district plan will define activities for the implementation of the various components within the plan.

CHAPTER 4 - IMPLEMENTATION OF THE DISTRICT PLAN

A. Staff Development

1. Rationale

The level of training needed by teachers depends on the amount of time a teacher spends using the computer as a tool in teaching, as opposed to the amount of time the teacher spends teaching about the computer itself. Training related to computers is not a one-time inservice activity. It must be continuous. As technology continues to evolve, so must the knowledge base of all teachers. Especially in the computer area, it is essential for the district to provide training and require participation of all staff, not just those with traditional interest.

2. Recommendations

School districts have the responsibility to provide workshops where staff can acquire the functional knowledge of computers and learn how to integrate them into the learning environment. It should be a structured, district-supported, on-going activity composed of the following strands:

- history and social impact
- impact on education
- computer concepts and operations
- use of computers in the classroom
- problem solving applications
- programming

Training must include time for the discussion of changes in the educational environment, including such topics as learning how to structure content in classrooms to accommodate technology, making curricular changes to use computers within existing curriculum, and determining the uses of computers for management.

Staff development must assist all staff to integrate computers into the existing environment in a manner that uses their many existing skills and knowledge, while acquiring new knowledge and skills which are peculiar to computer technology.

3. Content and learning outcomes

There are two levels of competence which are needed, depending on the individual teacher's assignment. They are:

- the core level
- the specialized level

The core level of competence is necessary for all teachers. It is recommended that all teachers receive some training in each of the components of the use of computers in education model. The specialized level is planned for some individual staff members to assist them to use technology fully in their respective fields.

4. Organization for inservice

Districts should consider various modes of instruction to meet staff development needs:

- individual instruction
- small group
- large group

A problem-solving, collaborative approach to computer inservice can establish a mechanism for attending to microcomputer technology and to other educational change as well.

In addition to discussion, plans should include teaching techniques for using computers and hands-on time for practice so that participants become thoroughly familiar and comfortable with the technology. In addition to class time, a district should consider a check-out system to allow teachers to work at home on evenings, weekends, and vacations to perfect their skills.

B. Software Selection, Acquisition, And Management

1. Selection and Evaluation

To achieve the full potential of a computer system, it is critical to evaluate and select software carefully. The process of evaluating and selecting computer software should be like that used to review any instructional media. The main considerations should be:

a. Educational content

- Does it fit the grade level intended; what is the readability level?
- Is the content accurate?
- Is it keyed to some of the instructional objectives of the course for which it is intended?
- Is it bias free in regard to sex and ethnic issues?
- Are there adequate examples for the student to follow?
- Is there a logical sequence to the presentation?
- Is it free of spelling, grammar and punctuation errors?
- Has the courseware been classroom and student validated?

b. Presentation format

- Does the software create an appropriate use of the computer?

- Is the reinforcement used in the software appropriate, such as
  - immediate and not delayed?
  - sound used in a positive way?
  - interesting visuals?
- Are the directions clear and precise?
- Does the spacing make the screen easily readable?
- Is the program interesting and not repetitious or boring?
- Is there a screen delay which is disconcerting?
- Does it use upper and lower case print styles ?

c. Interactivity of computer program

- Is it a creative use of the computer?
- Are responses personalized with the student's name?
- Are cues and prompts clear and in places where they are needed?
- Is provision for help readily available and accessible?
- Is the pace and sequence well controlled?

d. Teacher use

- Does the printed documentation contain
  - instructional objectives?
  - grade level designation?
  - clear directions for use?
  - suggestions for related activities?
  - validation information?
- Is the package appropriate for educational use?
- Is record keeping possible?
- Is it possible to make or obtain a back-up copy?

A number of organizations have developed forms for software evaluation. Those recommended are included in Appendix C of this document. These forms should be helpful as a district develops its own set of criteria for computer coursework selection.

2. Management Procedures

All computer software purchased by a district should be cataloged and processed (inventoried) in the same manner as all other media in the district is handled, no matter what source of funding is used for purchase. This is important for a number of reasons:

a. Cost effectiveness

1. It is essential that the district maintain an overall inventory of computer software to avoid unnecessary duplication in purchasing. Duplication or multiple copies of software may very well be necessary, but duplication should be a specific decision and not a "happening."

2. Some software is marketed with the same title or similar title by more than one company at vastly different prices. One person in the district (ideally the district media director) should have the responsibility of reviewing purchase requests with the district's inventory to avoid unnecessary duplication.

3. All software owned by a district should have district ownership labels and other necessary markings applied in a consistent manner to help avoid theft and loss, and to insure easy inventory at the end of the school year.

b. Best overall use of district resources. Some software can easily be shared between buildings or between teachers in a building. This software is the type that would be used for a short term in a classroom in a similar fashion to certain sound filmstrips or ITV programs. Other computer software will need to be checked out on permanent loan to a specific department, building, teacher, or administrator or to the program for which it was purchased. The district media director and building media specialist, along with those requesting the software, should make the decision as to where software will be housed; but it should all be centrally inventoried for better overall use of district resources. In other words, the concern is not so much where the software is housed but that it first be centrally inventoried.

c. Collection growth. At the present time, most school districts have a limited collection of computer software; but this collection will grow rapidly in the next few years. This potential proliferation of software makes it even more important for district inventories to be kept from the very beginning of computer software collection development. If buildings or individuals request software already owned by the district, they can discuss the merits and disadvantages with those who are already users of the software, have an opportunity for hands-on experience, and make better informed judgments.

C. Copyright Issues

Public Law 96-517, which Congress passed in December of 1980, amends a common copyright law to grant the owner of a particular computer program the

right to copy it if, and only if, (1) such a copy is "an essential step in the utilization of the program in conjunction with a machine," or (2) the copy is for archival purposes only, i.e. to serve as a back-up in case the original is lost or destroyed. Together, these exemptions are known as the "fair use" doctrine.

Some copying, then, is perfectly legal; the law as it now stands adequately responds to the need for back-up copies to protect the original investment in software. But that is where the line is drawn. A school may not purchase one copyrighted computer program and reproduce it in quantity for use with several computer systems without the express permission of the copyright owner. This practice is a violation of federal law.

If educators duplicate software that is copyrighted, it is possible that the commercial producers of educational software will not be able to recoup their original investment; and if the profits in writing and marketing educational software dry up, so may the potential supply of quality software.

D. Hardware Selection, Acquisition And Management

1. Selection Guidelines

a. Assessing needs

A list of the district's present and future needs, in line with the capabilities of the computer, is a good place to start. It is important to remember in this assessment that in most cases a computer can only use the programs designed to run on that make or type of computer. So, if classroom instruction is the main use intended for the computer, it is necessary to investigate the available software before making a hardware decision.

b. Factors to consider in selecting hardware:

1) What present and future instructional uses or applications are planned for the hardware?

2) What **software** is available for the uses planned for the computer? How good is the software and what do the reviews say about it?

3) What are the immediate **costs** of the equipment planned for purchase? What are the costs of expanding or upgrading the system? Inquire about interfaces and connections.

4) What **peripherals** are available to communicate with the computer or to increase its usefulness (i.e. printers, disc drives, light pen, graphics, tablet, game controller, modem)?

5) What is the **memory** capacity of the computer? Does it match the memory requirements of the desired software? How much does additional memory cost? What is the maximum amount of memory the computer can support?

6) What **languages** come with the computer? What other languages are available and how expensive is each additional language?

7) Is the **video display** terminal attached to the keyboard or is it separate? Can additional monitors be attached to the computer?

8) Is the **keyboard** laid out in standard typewriter style? What is the feel of the keyboard? Does the keyboard have special keys for specific purposes (i.e. graphics, data entry, text editing, programmable keys)?

9) Does the computer have **special features** which may be needed, such as graphics capabilities, sound and music, etc.? If not, can they be added?

10) What **documentation** is available for using the computer? Is it written for the novice or only for the technically oriented?

11) Is the equipment **user friendly**? Is the computer easy to use?

12) What are the **physical dimensions**? How much does the computer weigh? Can it be easily transported between classrooms?

13) What consulting services are available to the district for the hardware being considered?

A hardware evaluation checklist appears in Appendix D.

2. Hardware Deployment and Location

Computers should be located in buildings where they will provide the best access and the widest use. A number of options is available for computer placement.

a. Independent study - a computer is placed for student use in the IMC, independent study area, or lab area.

b. Department/teacher use - some departments (secondary) or schools (elementary) may need access to a computer system for teacher exploration/experimentation, the authoring of computer-assisted instruction (CAI) programs, testing and evaluation, etc. Others, such as guidance may utilize a computer in conjunction with students.

c. The "Traveler" - a mobile computer system for check-out to individual classrooms conducting a CAI or computer education unit.

d. Permanent assignment of a computer to a classroom - the curriculum may dictate this approach in some cases.

e. The computer lab - an area containing a sufficient number of computers so that each student or every two students would have immediate access to a computer. This may be used for a single discipline or for multidisciplinary use.

f. The networked classroom computer lab - a lab with computers networked to share software and peripherals.

g. Instructional/management - a computer for use by the staff for management information system applications.

A combination of options may be chosen. Location choices should be based on the intended use of the hardware and on the best accessibility possible for students.

3. Maintenance

Factors to consider:

- What warranties are available?
- Can the unit be serviced where it is purchased?
- Is on-site servicing available?
- Can local technicians make necessary repairs?
- Can the unit be updated for the next year to reflect refinements?
- How long does it take for service, including transportation to and from the service facility?
- What is the service charge, including transportation?
- Are agencies such as CESAs providing repair service for the hardware being considered?

4. Security

In an attempt to make the equipment as accessible as possible to all potential users, schools should adopt policies and procedures for the security of equipment, including plans for check-out to teachers for use at home.

Computer hardware should be inventoried and labeled in the same manner as a district or building deals with all other audiovisual hardware and equipment. One of the easiest and most cost-effective means for deterring theft, aiding insurance claims, and reclaiming stolen property is making ownership obvious and keeping up-to-date, readily-accessible inventories.

As schools become mass consumers of computer equipment, they also become a lucrative target for theft. Theft or vandalism of equipment can mean severe loss in terms of money, staff time, and program down time.

The Wisconsin Educational Media Association (WEMA) has recently published a manual on microcomputer security. It is available for $8.00 from:

Wisconsin Educational Media Association
c/o Don Jorgensen
McKinley I.S.C.
1010 Huron Street
Manitowoc, WI 54220

5. Safety

This aspect involves a wide variety of factors, including: reduction of glare on the monitor screen, appropriately leveled tables for keyboard use, sensitivity to the length of a work session, and awareness of the debate over potential health hazards.

E. Curriculum Planning And Development

1. The Computer Education Strand

Computers are becoming increasingly widespread tools in many professional fields. As a result, the need becomes more and more urgent to prepare all students, not just advanced math and science students, for a future with computers. The goal of computer education, then, is to expose all students to computers and computer applications in a variety of curriculum areas.

Since computers and other electronic technologies are having a revolutionary effect on our society, educational needs have changed, and will continue to change drastically. Skills and competencies deemed essential to succeed in our society in the past have become far less important in our present electronic age. As a result, if schools are to continue to play a major role in providing members of our society with equal opportunities, significant changes must be made in all curricular areas.

Several computerized applications provide examples of how previously important skills are becoming obsolete. For example,

a. What effect will widespread use of word processing and electronic spreadsheet programs have on the need to spend a significant amount of time teaching penmanship skills?

b. What effect will widespread use of calculators and programmable computing devices have on the need to spend nearely eight years teaching computation skills?

c. What effect will widespread access to comprehensive information retrieval services have on the need to teach factual information in all curricular areas?

In general, success in the electronic age will be less dependent on rote mechanical skills than on higher-level thinking and creative skills.

Elementary and secondary schools must question the relevance of the content of instructional programs in all curricular areas. We must not look to a movement "back-to-the-basics" but forward to the needs of future citizens. Curriculum content must be continually reviewed and changed.

A major portion of the experiences of today's children involves electronic communication devices such as television, computers, and video games. These are the "natural" tools of their time. In contrast, previous generations were more print-oriented and, as a result, were more receptive to learning through print technology. Educational effectiveness will be significantly increased with greater use of electronic educational tools to take students beyond traditional curriculum and learning activities to future-oriented curriculums and problem-solving activities which have not been previously available.

The major emphasis in a computer education program must be on the computer as a problem-solving tool. Educators must be cognizant of the possibilities of using the capabilities of the computer to develop higher levels of thinking: analysis, synthesis, and evaluative. The computer offers the opportunity for decision-making experiences for students, for their active involvement in learning, and the selection of learning activities, not merely passive reception of predesigned activities. It can offer the opportunity for creative, rather than conforming student behavior if school districts study and consider carefully the possibilities afforded by computer technology.

2. Scope and Sequence

The following scope and sequence for computer education is suggested as a model for local school districts. For each component, possible grade spans for introductory, developmental, and review activities are indicated. These designations have been made based on a student readiness level for the activity and from a representative cross sampling of what computer-literate districts are doing across the country. Local districts may use this table as a guide for deciding which of these various components may best be introduced to meet local needs. A local curriculum development committee will likely wish to state the learning outcomes more fully. The chart is necessarily abbreviated.

SCOPE AND SEQUENCE

I = Introduction
D = Development
R = Review for mastery

STRANDS

	K---3	4---6	7---9	10---12
HISTORY AND SOCIAL IMPACT				
History of computers and why they exist	I	D	D	D
How computers affect people's lives	I	D	D	D
What a computer can do	I	D	D	D
Careers	I	D	D	D
Artificial intelligence			I	D
Information in society		I	D	D
Everyday applications	I	D	D	D
Future implications: social, educational, ethical		I	D	D
Robotics	I	I/D	D	D
COMPUTER CONCEPTS AND OPERATIONS				
What is a computer?	I	D	D	R
Definitions (vocabulary)	I	D	R	R
Learning to use a computer	I	D	D	R

STRANDS

	K---3	4---6	7---9	10---12
Using the keyboard	I	D	D	R
Inputting, outputting, saving data	I	D	R	R
Executing programs	I	D	R	R
Computer characteristcs, advantages and disadvantages	I	D	R	R
Hardware - definition and use (peripherals)	I	D	D	R
Using prepared software (discs & cassettes)	I	D	D	R
PROBLEM SOLVING AND APPLICATIONS				
Data bases-introduction, prediction, generalization of data, statistical analysis		I	D	R
Sampling techniques			I	D
Statistical application			I	D
Information retrieval (on-line database searching)	I	D	D	D
Word processing		I	D	D
Electronic spread sheet				I/D

STRANDS	K---3	4---6	7---9	10---12
PROGRAMMING				
Programming programmable devices	I	D		
LOGO				
Turtle graphics-direction, distance, angle	I	D	D/R	
Squares, triangles, circles	I	D	D/R	
Procedures, repeated & combined	I	D	D/R	
Polygons and curves	I	I/D	D/R	
New shapes and characters	I	I/D	D/R	
Counting	I	I/D	D/R	
Editing procedures	I	I/D	D/R	
Coordinates	I	I/D	D/R	
Random numbers	I	I/D	D/R	
Numbers and arithmetic	I	I/D	D/R	
Words and lists	I	I/D	D/R	

STRANDS	K---3	4---6	7---9	10---12
BASIC				
Flowcharting		I	D	D
Formulas (variables and constants)		I	D	D
String data		I	D	D
Relations		I	D	D
Looping		I	D	D
Graphics		I	D	D
Arrays (one-dimensional)		I	I/D	D
Functions		I	D	D

STRANDS	K---3	4---6	7---9	10---12
Algorithms		I	D	D
Arrays (two-dimensional)			I/D	D
Matrices			I/D	D
Files			I/D	D
PASCAL, COBOL, and other language, as determined by the district curriculum			I	D
Assembler/machine language				I/D
Computer systems			I	D
Design logic			I	D
Systems design			I	D

3. Curriculum Development Checklist

Curriculum is defined in this paper as a written document that is a plan for the education of pupils during their enrollment in school. Curriculum clarifies what will be taught, when it will be taught, and the ways it might be taught and indicates how people will know whether the educational effort was successful or not. A computer education curriculum committee should use this model, or some similar checklist, to determine that a quality, sound curriculum plan is written and published.

Curriculum Review Checklist

a. Does the computer education curriculum document fit in adequately with the district curriculum and educational philosophy?

b. Does the document clarify for students, staff, and community the philosophy, mission, and elements of the computer education curriculum?

c. Does the document have a process for verifying that what is being offered is important, worthwhile, and accepted by the various groups in the district?

d. Does the document offer a plan that is realistic in light of resources available, and does it offer a good possibility of success?

e. Does the document allow for:

1. assessment of needs?
2. planning?
3. implementation?
4. evaluation?
5. reporting to the public?

f. Does the document sufficiently provide for:

1. scope?
2. sequence?
3. instructional strategies?

g. Does the document provide for learner outcomes in the domains of:

1. cognition?
2. skills?
3. attitudes?

h. Does the document suggest several approaches to accommodate a variety of learning styles and developmental needs?

i. Does the document allow for both:

1. formative evaluation?
2. summative evaluation?

j. Does the document allow for review and revision as some goals are achieved and new needs are identified?

CHAPTER 5 - ASSESSING PROGRAM IMPLEMENTATION

Most successful computer education programs show visible evidence of computers being integrated into the life and learning of the classroom, rather than being limited to a small amount of directed class time. Where computers have been effective, the teacher often has arranged for the machines to be accessible to students on a flexible basis so that they may serve as resources in a wide range of subject matters, as well as computer literacy for its own sake.

Questions such as the following may be of help in developing a mode for evaluating all aspects of the program model.

A. There exists a systemwide implementation plan for computers.

1. Does the district now have a long-term plan for acquisition and introduction of computers and computer-related software? Does it include maintenance and teacher education?

2. If not, is such a plan anticipated or in preparation?

B. The school system itself--including teachers, students, parents, and the larger community--judges the program to be successful.

1. Do you think your computer education program is successful?

2. Does positive feedback come from teachers, students, parents, employers, and the community?

C. Students are motivated to engage in computer activities, even when not required.

1. Do students ask to use computers outside of class time?

2. Are regular hours for student use arranged, and is there substantial usage?

3. Are students allowed to take computers home overnight, on school vacations, or on weekends?

D. Non-technical teachers and non-science/non-math teachers are excited about the use of computers and incorporate them into their classroom activities on a subject-related or informal basis.

1. Who uses the computers in your school: specialists, math department, science department, business department?

2. Do elementary teachers use computers?

3. Do self-contained classroom teachers use computers?

E. Curriculum is modified to reflect the advantages offered by the new technology.

1. Has curriculum been revised to include use of computers? In what subject areas? For what grade levels?

F. Teachers work together to institutionalize and expand the use of computer-related instruction.

1. Do teachers work together to expand the use of computers?

2. Is there a user group--formal or informal--that meets in a school, in the district, or across districts?

3. Are teachers allowed to take computers home overnight, on school vacations, or on weekends?

G. The district provides funds for acquisition of hardware and software, teacher training, curriculum revision, and hiring of specialists and/or consultants.

1. Does the district spend its own funds for hardware/software, teacher education, curriculum revision, and hiring specialists?

2. Does the district pay for release time for teachers to take courses?

3. Does the district offer inservice courses?

APPENDIX A

Division for Library Services (DLS)
- Reference and Loan
- Wisconsin Dissemination Program

Divison for Instructional Services (DIS)

Division for Handicapped Children & Pupil Services (DHCPS)

WIS/NET

Funding Sources

Wisconsin Instructional Computing Consortium (WICC)

University System

Wisconsin Library Association (WLA)

Wisconsin Educational Media Association (WEMA)

Wisconsin Association for Educational Data Systems (WAEDS)

Wisconsin Mathematics Council

User Groups

State Purchasing Plans

Community Involvement and Participation

For information concerning any of the above resources, contact M. Elaine Anderson, Supervisor for Microcomputers and Instructional Technology, Department of Public Instruction. (608) 266-3856.

APPENDIX B

SUMMARY OF EQUITY ISSUES

Issues related to computer equity for students who are disadvantaged, female, or members of racial and/or ethnic minority groups fall into three areas: (1) access to computer literacy and computer-assisted instruction; (2) tracking through differential uses of computer technology: and (3) exposure to bias and stereotyping in educational software. Key questions for each of these three areas follow:

1. ACCESS TO COMPUTER LITERACY AND COMPUTER-ASSISTED INSTRUCTION

A. Do school districts with lower tax revenues have fewer computers than do districts with higher tax bases?

B. Are the schools with the fewest computers situated in lower socio-economic neighborhoods where parents are less likely to have personal computers in their homes?

C. Within an individual school district, are there fewer computers in schools with less influential and/or less affluent parent groups?

D. How are the students selected for computer time? Are the computers considered more appropriate for certain groups of students on the basis of their academic achievement, sex, race/ethnic group, learning disability or socio-economic level?

E. Is the math anxiety sometimes experienced by females transformed to machine anxiety that limits female students' access to computer technology?

F. What role do teacher and student expectations and stereotyping play in the selection of students for computer time?

G. Is there differential access to staff development activities so that teachers of certain groups (minority, handicapped, lower achieving students) are less likely to have access to computer literacy and computer-assisted instruction?

2. TRACKING THROUGH DIFFERENTIAL INSTRUCTIONAL USES OF THE COMPUTER

A. Are higher achieving students using the computers for simulations and development of higher order skills while special education students and lower achievers are restricted to drill and practice activities?

B. Are male students given opportunities to explore higher order skills and simulations while female students' opportunities focus primarily on word processing and record keeping?

C. Is time on the computer seen as a reward for certain groups of students and as a punishment for others?

D. Does the educational software emphasize one learning style that has a negative impact on certain groups of students on the basis of their race, ethnic group, sex or cultural background?

3. **EXPOSURE TO BIAS, STEREOTYPING AND NEGATIVE VALUES INHERENT IN THE EDUCATIONAL SOFTWARE**

A. Does the educational software use language that reflects bias on the basis of race, sex, ethnic group or disability?

B. Does the educational software (text or graphics) reflect stereotyping on the basis of race, ethnic group, sex, or disability?

C. Does the educational software present the contributions of racial and ethnic groups and females and males in unrealistic and/or historically inaccurate ways?

D. Are females and minorities excluded or underrepresented in either the text or graphics of the educational software?

E. Does the educational software employ violence or extreme forms of competition for either instruction or for rewards for successful completion of the instructional task?

HUMAN VALUES CRITERIA FOR EVALUATING EDUCATIONAL SOFTWARE

Since the most educational software evaluation forms do not contain criteria related to human values, the Mid-Atlantic Centers for Race and Sex Equity have developed these five items that can be incorporated into any software assessment. These criteria may be duplicated and used as long as credit is given to the centers.

1.	Is the language used in the educational software free from bias on the basis of race, sex, ethnic group, or disability?	Yes	No
2.	Are the text and graphics free from stereotyping on the basis of race, ethnic group, sex or disability?	Yes	No
3.	Are women and minority group members proportionally represented in text and graphics?	Yes	No

4.	Are the contributions of all racial and ethnic groups and women and men presented in realistic and/or historically accurate ways?	Yes	No
5.	Is the educational software free from violence or extreme forms of competition?	Yes	No

Developed by
The Mid-Atlantic Centers for Race and Sex Equity
The American University
April 1983

Northwest Regional Educational Laboratory

MicroSIFT Courseware Evaluation

(page 2 of 3)

1. Describe Package Content and Structure.

Copyright 1980

	RATING: Strongly Agree / Agree / Disagree / Strongly Disagree	Not Applicable	WEIGHT: High / Medium / Low		
CONTENT	SA A D SD	NA	H M L	2.	Content is accurate.
	SA A D SD	NA	H M L	3.	The content has educational value.
	SA A D SD	NA	H M L	4.	The content is free of race, ethnic, and sex stereotypes.
INSTRUCTIONAL QUALITY	SA A D SD	NA	H M L	5.	The purpose of the package is well-defined.
	SA A D SD	NA	H M L	6.	The package achieves its defined purpose.
	SA A D SD	NA	H M L	7.	Presentation of content is clear and logical.
	SA A D SD	NA	H M L	8.	The level of difficulty is appropriate for the target audience.
	SA A D SD	NA	H M L	9.	Graphics/color/sound are used for appropriate instructional reasons.
	SA A D SD	NA	H M L	10.	Use of the package is motivational.
	SA A D SD	NA	H M L	11.	The package effectively stimulates student creativity.
	SA A D SD	NA	H M L	12.	Feedback on student responses is effectively employed.
	SA A D SD	NA	H M L	13.	The learner controls the rate and sequence of presentation and review.
	SA A D SD	NA	H M L	14.	Instruction is integrated with previous student experience.
	SA A D SD	NA	H M L	15.	Learning is generalizable to an appropriate range of situations.
TECHNICAL QUALITY	SA A D SD	NA	H M L	16.	The user support materials are comprehensive.
	SA A D SD	NA	H M L	17.	The user support materials are effective.
	SA A D SD	NA	H M L	18.	Information displays are effective.
	SA A D SD	NA	H M L	19.	Intended users can easily and independently operate the program.
	SA A D SD	NA	H M L	20.	Teachers can easily employ the package.
	SA A D SD	NA	H M L	21.	The program appropriately uses relevant computer capabilities.
	SA A D SD	NA	H M L	22.	The program is reliable in normal use.

23. CHECK ONLY ONE	___	I would use or recommend use of this package with little or no change. (Note suggestions for effective use, next page.)
	___	I would use or recommend use of this package only if certain changes were made. (Note changes under major weaknesses, next page.)
	___	I would not use this package. (Note reasons under major weaknesses.)

24. If you would consider using this package describe procedures for its effective use in specific classroom settings.

- -

25. List one or two major strengths of the package with supporting comments.

- -

26. List one or two major weaknesses of the package with supporting comments.

- -

27. ☐ In the box at the left, indicate your overall opinion of this package by writing an integer from 1 to 10 (10 being the high value).

Copyright 1980, Northwest Regional Educational Laboratory
11/80 Field Test Version

COURSEWARE EVALUATION FORM

Name of program _____

Manufacturer's or distributor's name _____

Address _____

Cost _____ Copyright/date _____

Available for what microcomputers (model and memory) _____

Peripherals needed _____

Reviewer's name _____ Date _____

Description of program _____

_____

_____

Appropriate grade level: primary inter. jr high sr high college

Type of computer application(s) (check one or more)

___ simulation
___ tutorial
___ drill and practice
___ game
___ problem solving
___ remediation
___ enrichment
___ management (only)
___ diagnostic/prescriptive
___ other_____

Kinds of courses for which this program is appropriate

_____

Prerequisite skills or courses needed

_____

ANALYSIS (check yes, no or not applicable)	YES	NO	NA
a. Content has clear instructional objectives.	___	___	___
b. Content is accurate.	___	___	___
c. Content has educational value.	___	___	___
d. Content is free of stereotypes.	___	___	___
e. Content expresses positive human values.	___	___	___
f. Program is appropriate for targeted audience.	___	___	___
g. Computer branches to appropriate difficulty.	___	___	___
h. Graphics/sound/color have instructional value.	___	___	___
i. Frame display is effective.	___	___	___
j. Students can use program easily.	___	___	___
k. Teachers can utilize the program easily.	___	___	___
l. Documentation is comprehensive.	___	___	___
m. Computer is an appropriate tool for activity.	___	___	___
n. User can control rate/sequence/directions.	___	___	___
o. Feedback used is effective and appropriate.	___	___	___

RECOMMEND for purchase? ___yes ___no ___conditional on:

Permission to reproduce for classroom use by Microcomputer Resource Center, Teachers College, Columbia University, New York, New York.

SCHOOL MICROWARE EVALUATION FORM

(This form may be copied as needed; for additional information, see School MicroWare Vol. 1 No. 1)

Your Name_____Organization_____Position_____

Product Name_____Supplier_____No. of Progs. Under This Name_____Price $_____

Applicable School Dept/Subj/Topic _____

INSTRUCTIONS - For open ended items, supply all information requested in blanks provided if possible; use extra sheets if necessary. For objective items (those with blanks to left), enter a number in the blank to indicate the extent to which the program fulfills the description in the item, as follows: 2 - Completely, 1 - Partially, 0 - Not at All. If the item is not applicable to the program, enter N/A. If the item is unclear, enter U. Elaborate on answers as necessary in Comments section at end or on extra sheets, giving item numbers.

OVERVIEW - Describe the program briefly in terms of its goals and what it does to achieve them (no evaluation here).

_____

_____

PRELIMINARY CONSIDERATION - Assuming that this program contributes to the teaching of one or more topics, is that topic one which is or should be taught in today's schools? Yes No If not, give your reasons for this answer in the Comments section at the end of the form and omit the balance of the questionnaire.

DOCUMENTATION - List materials accompanying the program, e.g., teachers guide, student workbook.

_____ 1. Indicate types of information included.
- _____ a. Suggested course/subject, grade levels.
- _____ b. Goals.
- _____ c. Performance objectives.
- _____ d. Suggested teaching strateg(ies).
- _____ e. Correlation with standard texts.
- _____ f. Prerequisites for use of program.
- _____ g. Student exercises, teacher answers.
- _____ h. Operating instructions.
- _____ i. Listing and sample runs of program(s).
- _____ j. If a simulation, description of the model used.
- _____ k. Suggested topics for follow-up discussions.
- _____ l. Suggested references/activities for follow-up.

_____ 2. The documentation is written clearly.

_____ 3. If a workbook is included, the format and content are appropriate.

INSTRUCTIONS GIVEN TO USER BY PROGRAM

1. The instructions are adequate regarding:
   - _____ a. The instructional task to be performed.
   - _____ b. Details of how to interact with the program.
2. _____ User has the option of skipping instructions if already known.

STUDENT-COMPUTER DIALOG

1. _____ Output is displayed screen by screen (paged) rather than scrolled.
2. If output is paged:
   - _____ a. User has control over continuing to the next page.
   - _____ b. Amount of information in each page is appropriate.
   - _____ c. The perceptual impact (amount of type and lines) is suitable.
3. _____ Output is spaced and formatted so as to be easily readable.
4. _____ Language is well suited to most students' reading ability.
5. _____ Uses correct grammar, spelling, hyphenation and punctuation.
6. _____ Any grid or coordinate system used is consistent with common conventions.
7. _____ Students can respond with common symbols & ways of using them, e.g., right to left entry of sums.
8. _____ Accepts abbreviations for common responses.
9. _____ Provides for individual needs, e.g., opportunity to work with harder or easier material.
10. _____ Dialog is personalized, i.e., makes appropriate use of student names.
11. _____ Uses devices to get & maintain interest, e.g., variation of computer responses, humor, pace change, surprise.
12. Makes good use of any special features of computer:
    - _____ a. Graphics
    - _____ b. Color
    - _____ c. Sound
13. _____ Reinforcing responses (indications of right, wrong, etc.) are appropriate.
14. _____ The number of wrong answers allowed is reasonable.
15. _____ Responds appropriately if allowed number of wrong answers is exceeded.
16. _____ Provides opportunity to get help if difficulty is encountered.
17. _____ Minimizes bad entries via devices such as objective formats (multiple choice, etc).
18. _____ Deals well with inappropriate entries, i.e., response to typing errors, etc., is intelligible and useful.
19. _____ Required entries are within students' capabilities (esp. typing, vocabulary).
20. _____ Reports student performance periodically and at end of session.

MISCELLANEOUS CONCERNS

1. _____ If a simulation, the program gives a sufficiently accurate representation of the situation simulated.
2. _____ The concepts and vocabulary required to use the program are reasonable.
3. _____ Operates properly and is free of bugs.
4. _____ Is well structured and documented internally to facilitate any necessary debugging/modification.

COMMENTS - Please use this space and additional sheets as necessary to provide any other information which you believe would help someone who was considering acquiring the program being reviewed. In particular, indicate what you like least and most about the program. Also, list any changes which should be made.)

_____

_____

Educational Software Evaluation Form

© Educational Alternatives, 1981

Program Name_____ Producer_____ Cost_____
Subject Area_____ Reviewer_____ Date_____

1. Describe the intended educational purpose:

2. Instructional Range:Grade levels_____Ability levels_____

3. Instructional Grouping: Individual____, Small group(size)_____large group (size)_____

4. Program uses: Drill and practice___ Tutorial___ Simulation___ Instructional Game___ Strategy game___
Problem solving___ Information Source___ Software tool(type)_____ Other_____

5. Comment on Appropriateness for Instructor:
To what extent does the program allow a teacher to adjust for different uses and different users?

To what extent does the program require teacher assistance?

What is the implied view of the learner and the learning process?

Is the program educationally appropriate?

6. Comment on Appropriateness for Student:
Are the directions clear?

Is it simple to use?

Is it developmentally appropriate considering physical, intellectual and emotional maturity?

Would most of your students enjoy using this program?___ If not, describe those who would.

7. Comment on:
The instructional significance of the program:

The compatability with educational philosophy, teaching style and curriculum generally encountered by the student:

Reviewer's Name_____

Program Name_____

8. What happens when a student makes a mistake in entering answers?

   What happens when a student makes a mistake in content?

9. Can the student get help from the program?

   Can the student review the instructions once the program has started?

10. To what extent is the user given choices?

    To what extent does the user feel in control?

11. Indicate the social characteristics present:

	present & negative	present & positive	not present
competition			
cooperation			
personification of the computer			
moral issues and value judgements			
appropriate inclusion of women& minorities			

12. Describe any unintentional learning, both positive and negative:

13. To what extent does the program use the computer's potential for interaction, immediate feedback, animation, color, music, sound, etc.?

14. To what extent does the program offer more than one mode of learning (visual, verbal, numerical, aural), in a way that reinforces and supports the learning focus?

15. In what ways (and under what circumstances) can this program provide students with a more effective learning experience than they could have had without a microcomputer?

16. Briefly support your reccomendation for____ or against___purchase of this program by your school system:

SOFTWARE EVALUATION CHECKLIST

PROGRAM NAME: _____ SOURCE: _____ COST: _____

SUBJECT AREA: _____ REVIEWER'S NAME: _____ DATE: _____

1. INSTRUCTIONAL RANGE

_____ grade level(s)

_____ ability level(s)

2. INSTRUCTIONAL GROUPING FOR PROGRAM USE

_____ individual

_____ small group (size: _____)

_____ large group (size: _____)

3. EXECUTION TIME

_____ minutes (estimated) for average use

4. PROGRAM USE(S)

_____ drill or practice

_____ tutorial

_____ simulation

_____ instructional gaming

_____ problem solving

_____ informational

_____ other (_____)

5. USER ORIENTATION: INSTRUCTOR'S POINT OF VIEW

low				*high*	
•	•	•	•	•	flexibility
•	•	•	•	•	freedom from need to intervene or assist

6. USER ORIENTATION: STUDENT'S POINT OF VIEW

low				*high*	
•	•	•	•	•	quality of directions (clarity)
•	•	•	•	•	quality of output (content and tone)
•	•	•	•	•	quality of screen formatting
•	•	•	•	•	freedom from need for external information
•	•	•	•	•	freedom from disruption by system errors
•	•	•	•	•	simplicity of user input

7. CONTENT

low				*high*	
•	•	•	•	•	instructional focus
•	•	•	•	•	instructional significance
•	•	•	•	•	soundness or validity
•	•	•	•	•	compatibility with other materials used

8. MOTIVATION AND INSTRUCTIONAL STYLE

passive				*active*	
•	•	•	•	•	type of student involvement

low				*high*	
•	•	•	•	•	degree of student control

none	*poor*				*good*	
•	•	•	•	•	•	use of game format
•	•	•	•	•	•	use of still graphics
•	•	•	•	•	•	use of animation
•	•	•	•	•	•	use of color
•	•	•	•	•	•	use of voice input and output
•	•	•	•	•	•	use of nonvoice audio
•	•	•	•	•	•	use of light pen
•	•	•	•	•	•	use of ancillary materials
•	•	•	•	•	•	use of _____

9. SOCIAL CHARACTERISTICS

present and negative	*not present*	*present and positive*	
_____	_____	_____	competition
_____	_____	_____	cooperation
_____	_____	_____	humanizing of computer
_____	_____	_____	moral issues or value judgments
_____	_____	_____	summary of student performance

1. The grade levels and ability levels for a particular program are primarily determined by the concepts involved. Other important factors are reading level, prerequisite skills, degree of student control, and intended instructional use. It is possible for a program to be flexible enough to be used across a wide range of grade levels and ability levels.

2. Some programs are designed for use by individuals. Others have been or can be modified for participation by two or three persons at a time. Simulations or demonstrations often pose opportunities for large-group interaction. A given program may be used in more than one grouping, depending on the instructor.

3. The time required for the use of a program will vary considerably. Include loading time for cassettes. A time range is the appropriate response here.

4. Instructional programs can be categorized according to their uses. Some programs may have more than one use, thus falling into more than one of the following categories:

Drill or practice: Assumes that the concept or skill has been taught previously.

Tutorial: Directs the full cycle of the instructional process; a dialogue between the student and the computer.

Simulation: Models selected, alterable aspects of an environment.

Instructional gaming: Involves random events and the pursuit of a winning strategy.

Problem solving: Uses general algorithms common to one or more problems.

Informational: Generates information (data).

5. These are factors relevant to the actual use of the program from the point of view of an instructor.

Flexibility: A program may allow the user or the instructor to adjust the program to different ability levels, degrees of difficulty, or concepts.

Intervention or assistance: A rating of "low" means considerable teacher intervention or assistance is required.

6. These are factors relevant to the actual use of the program from the point of view of a student.

Directions: The directions should be complete, readable, under the user's control (e.g., should not scroll off the screen until understood), and use appropriate examples.

Output: Program responses should be readable, understandable, and complete. If in response to student input, the output should be of an acceptable tone and consistent with the input request.

Screen formatting: The formats during a program run should not be distracting or cluttered. Labels and symbols should be meaningful within the given context.

External information: A program may require the user to have access to information other than that provided within it. This may include prerequisite content knowledge or knowledge of conventions used by the program designer as well as maps, books, models, and so on.

System errors: System errors result in the involuntary termination of the program.

Input: A program should ensure that a user knows when and in what form input is needed. It should avoid using characters with special meanings, restrict input locations to particular screen areas, and require minimal typing.

7. These are matters relevant to the subject-matter content of the program.

Focus: The program topic should be clearly defined and of a scope that permits thorough treatment.

Significance: The instructional objectives of the program must be viewed as important by the instructor. Also, the program should represent a valid use of the computer's capabilities while improving the instructional process.

Soundness or validity: The concepts and terms employed should be correct, clear, and precise. Other important factors are the rate of presentation, degree of difficulty, and internal consistency.

Compatibility: The content, terminology, teaching style, and educational philosophy of the program should be consistent with those generally encountered by the student.

9. Competition, cooperation, and values are concerns that may be a function of the way a program expresses them. (War gaming and the "hangman" format are sample issues.) Also, the "humanizing" of the computer may serve for motivation or to reduce anxiety, but it also may become tedious, misleading, and counterproductive.

The summary of student performance can be dichotomous (win or lose), statistical (time expended or percent of items correct), or subjective (as in the evaluation of a simulation). It may be for student, teacher, or both.

From "Guidelines for Evaluating Computerized Instructional Materials," by William P. Heck, Jerry Johnson, and Robert J. Kansky. Copyright 1981, by The National Council of Teachers of Mathematics, Inc.

Hardware Evaluation Worksheet

On the tally sheet below, assign an *importance factor* of 1 to 3 for each category, depending on how important you think each category is to your decision. The factor should be developed by your district committee and should be consistent as you rate various machines. **1 = Not important; 2 = Important; 3 = Very important.**

As you compare machines, give each one a *rating* of 1 to 3 in each category (**1 = Poor; 2 = Average; 3 = Good**). For example, if dealer service is not available, give it a 1 under the "Service" category; if it is good, give it a 3. If the machine is easily moved and compact, the "Flexibility" category may get a 2 or 3. If no software is available, that category may be given a 1.

When all the categories have been rated, multiply them by the importance factor you originally assigned. The end results are then added together. The highest total will indicate the microcomputer best suited for your uses. Be as sincere as possible to get an unbiased evaluation. Color of the case, unnecessary extras, or the salesperson's personality should not affect the choice.

SAMPLE:

Brand Brand X

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost	3	2	6
Service	2	1	2
User Training	1	3	3

Brand _____

Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

Total _____ 37

Brand _____ Category	Importance Factor (1 to 3)	Rating (1 to 3)	Total
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

Total _____

Brand _____			
Cost			
Service			
User Training			
System Expansion			
Flexibility			
Software			
Memory			
Keyboard			
Display			
Peripherals & Options			
Sound, Music, Voice, Graphics			

Total _____

APPENDIX E

A POSITION PAPER ON KEYBOARDING

Developed for the

DEPARTMENT OF PUBLIC INSTRUCTION

What is Keyboarding

"Keyboarding is the act of inputting information into various types of equipment through the use of a typewriterlike keyboard.[1] (Hanson and Rigby, p. iv).

Who needs Keyboarding Skills

People in almost every walk of life need keyboarding skills to support their personal and business activities.

> "Governmental agencies, business organizations, educational institutions, and individuals have all experienced the extremely rapid growth of information and increased need to access this information. Much of this information and data is communicated, summarized, calculated, recorded, classified, stored, and retrieved electronically. If any of this information is processed on a simple machine such as an electric typewriter - or on the latest model of computer or word processor - the person processing it will use a common element: the keyboard."[2] (LaBarre, et al., p. vi).

> "Tasks that were formerly manual operations have now become automated through the use of computers and other equipment which use a keyboard for data entry. Some of the positions that now require keyboarding skills include the bookkeeper who enters journal transactions into a computer via a keyboard; the records manager who uses the computer terminal keyboard to locate specific documents in the file; the inventory clerk who keeps track of shipments of stock and receipt of new stock via the computer terminal; the airline agent who uses the keyboard for reservations, passenger check-ins, and seat assignments; and the business executive who has a computer terminal on the desk to access current information which will be useful in making managerial decisions."[3](Hanson and Rigby, p. v).

With the rapid expansion of computers, primarily microcomputers, it is paramount that educational institutions require that all students obtain a keyboarding skills. This will enable them to function in the world of computers.

Keyboarding skill will allow students to more efficiently interface with microcomputers in an educational setting as well as in a personal and/or a future employment setting. For the foreseeable future, the standard keyboard, as used on typewriters, word processors, microcomputers, computer terminals, and numerous other input devices, will serve as the primary device for inputting information (words, numbers, and symbols) into electronic information processing systems (word processing, computers, or integrated systems).

> "The widespread application of microcomputers is a societal, not merely an educational phenomenon.
>
> From the beginning of history through 1980, approximately one million computers were produced. The three top manufacturers of microcomputers plan to produce one million computers during calendar year 1982. Recent projections estimate a 40% annual growth rate to 3.7 million units valued at 3.9 billion dollars in 1985. The eventual adoption of computer technology is not a decision that is in the hands of the educational community. This is a phenomenon that is being embraced by some of the more conservative elements of our society."[4] (Hafmeister, p. 116).

Every facet of business and industry is finding it impossible to function without the help of computers--from micros to mainframes. A film produced by the Learning Corporation of America in 1979 stated that the cost of most business would increase 40 percent without the use of computers because of the increased number of employees needed to handle data.[5] (Learning Corporation of America, 1979)

One midwestern school of business requires that all students possess a keyboarding skill prior to enrollment in the school's introductory data processing course. Carnegie-Mellon University is one of several universities that will begin requiring each incoming freshman to purchase a microcomputer. This microcomputer will be purchased over the four-year period and will be the students' personal computer at that time.

The keyboard, until voice input is perfected sometime in the future, will be the most used tool at our fingertips. Its impact may be greater than that of the printing press. A keyboard, used in conjunction with the telephone, will become the communication system for the next decade.

In order to satisfy personal and employment needs, students must learn to use the common input tool--the keyboard.

When Should Keyboarding Instruction Begin?

Students should develop keyboarding skills just prior to the time they will apply the skill. Therefore, it is inappropriate to make an arbitrary decision or recommendation on which grade level keyboarding skills are most suitably developed.

Students are using microcomputers from kindergarten through their final year in college. Most educational software packages used in kindergarten through the elementary grades require inputting one- and two-character responses to drill and practice problems used on microcomputers. This level of input does not require a "touch skill" on the keyboard.

However, when students are to become involved in work with a microcomputer that can be facilitated by touch control of the keyboard, a keyboarding skill should be developed.

Some examples of activities at the microcomputer that are carried out more easily with keyboarding skill are: a. entering data sets for completing problems, b. entering text material when using word processing software, and c. entering program statements when learning a language for problem solving.

What Skill Level Should Students Achieve?

Students enrolled in keyboarding courses should reach 30-40 wpm (3-4 lines) with one error/minute on a one-, two-, or three-minute timed writing. This touch skill should be reached in 25-45 hours of instruction.

These standards/expectations are comparable to those identified by Dr. Patsy A. Dickey-Olson for her course entitled "Keyboarding Skills for Business Majors." She states:

"The student completing the course should be able to perform the following skills:

--Demonstrate the correct 'touch' system techniques for operating the alpha-numeric keys.

--Demonstrate the correct 'touch' technique to be used on a ten-key numerical pad.

--Demonstrate a straight-copy speed of 30 words-per-minute and an accuracy level of not more than two errors-per-minute.

--Demonstrate the ability to work from typed and rough-draft material.

--Demonstrate the ability to detect and correct errors in completed work (proofread).

--Demonstrate the ability to follow oral and written direction.

--Demonstrate the ability to backspace and correct errors. . ."[5] (Dickey-Olson, Vol. 3, No. 2)

Why Should Business Education Teachers Teach Keyboarding?

"Teaching the typewriter keyboard and building initial basic skill can be an exciting experience for both teachers and students. The degree to which this will be so depends largely upon the teacher's enthusiasm and skill in

1. motivating learners through goal setting;
2. giving students a model to follow by carefully planned and executed demonstrations;
3. observing the process of learning (the hands and fingers) more than the product (paper checking);
4. pacing students through dictation and time-interval procedures at appropriate speeds;
5. providing feedback and suggestions that help students succeed;
6. showing an interest in each student's dfficulties as well as successers."[9] (Robinson, p. 57)

The development and mastery of keyboarding skills is a crucial teaching area. Teachers certified in typewriting are prepared to deliver instruction using correct methodology and psychological principles for psychomotor skill development. This same level of teaching preparedness in needed by those individuals teaching keyboarding.

> "The behavior of the teacher in the classroom has either a positive or a negative effect upon the learning of students (Bloom, 1975, 108-38) . . . teaching typewriting is even more complex than learning to typewrite. Effective teaching requires knowledge of the learning process, skill in arranging the conditions of learning, and skill in the process of interacting with students and manipulating human characteristics toward worthwhile ends . . . The kind of guidance and direction given students in the typewriting classroom is a potent factor affecting motivation to learn and rate and degree of learning."[7] (Robinson, et al, p. 13)

Business education instructors prepared to teach typewriting learn to recognize student readiness for developing new typing skills. They are prepared to recognize student readiness and maturation as they prescribe exercise activities for students. The same preparation is needed for those who will teach keyboarding.

> "Motivation is a crucial component of all instruction, including typewriting. However, it is necessary to understand what is involved in motivation in order to use it effectively. Motivation is not a single activity that can be predetermined in a classroom, but should result from all of the activities that are used within the classroom."[8] (McLean, p.6)

Business education instructors are taught to take advantage of intrinsic and extrinsic motivational techniques for psychomotor skill development. It is the instructors' ability to utilize these diverse motivational stimulants that aid them in helping students develop the highest level of skill possible within the scheduled instructional time constraints of the classroom. Once again, the keyboarding instructor must be able to capitalize on the same student stimulations.

> "The teaching of typewriting is a complex and demanding activity. It is not an act to be delegated to just anyone. Almost anyone can maintain order and grade papers in a typewriting classroom (manage learners). But

it takes a knowledgeable teacher who understands how skill learning occurs to teach typewriting as it can and should be taught (manage learning). The task is not easy, but anything worthwhile takes effort . . .[10] (Robinson, p. 18)

What Equipment Is Needed?

A keyboarding work station should contain, at the minimum, the following components:

a. Standard typewriter keyboard containing cursor-control keys

b. Video monitor--black and white, green, or amber screen

c. Secondary storage device--floppy disk, hard disk, or cassette tape

d. 10-key numeric pad--either built into the keyboard or as an attachment to the system

What Software is Needed?

If software is selected for use in the keyboarding class, the instructor should ensure that it complements the course objectives. Any software selected should be pedagogically sound and supported by teacher usable documentation.

Some of the software packages currently available (as of April, 1983) that may be used, to some extent, as an instructional aid include:

a. Hi-Res Mastertype, Lightning Software, P.O. Box 11725, Palo Alto, CA 94306, 1981 (APPLE)

b. Cooks Typing Tutor, Cook's Computer Company, 1905 Bailey Drive, Marshalltown, IA 50518 (APPLE)

c. Progressive Touch Typing Tutor, Progressive Software, Suite 323, Blue Bell West, Blue Bell, PA 19422 (APPLE)

d. Microsoft Typing Tutor, Microsoft Comsumer Products, 10800 N. E. Eight, Suite 507, Bellevue, WA 98004 (APPLE/TRS-80)

e. MECC Business Volume 1 includes a program on the disk called TYPING which gives user practive in improving their typing speed (APPLE)

f. Gregg Keyboarding for Information Processing, Gregg/McGraw-Hill, 13955 Manchester Road, Manchester, MO 63011, 1982 (APPLE/TRS-80)

g. Basic Information Keyboarding Skills, South-Western Publishing Co., 355 Conde Street, West Chicago, IL 60185, 1982 (APPLE/TRS-80)

h. Typing strategy, Behavioral Engineering, 230 Mount Hermon Rd., Suite 20, Scotts Valley, CA 95066 (408/438-5649) (APLLE/IBM PC/Commodore 64/VIC 20)

i. Letter Man, Behavioral Engineering, 230 Mount Hermon Rd., Suite 207, Scotts Valley, CA 95066 (408/438-5649) (APPLE/IBM PC/Commodore 64/VIC 20)

j. Typing Teacher, Instant Software, Peterborough, NH 03458 (TRS-80 Model I & II)

k. Type Right, Barron Enterprises, 714 Willow Glen Road, Santa Barbara, CA 93105 (APPLE II, PET/CBM, Super PET or CBM)

Are There Other Teaching Considerations?

When teaching keyboarding, the focus is on the input rather than output. Students must be quick and accurate when inputting and must learn how to make corrections when incorrect characters are inputted. Less emphasis may be placed on learning outputting skills since the computer software usually provides for formatting considerations when copy is printed on paper. However, in keyboarding, just as in typewriting:

> "The major procedures bear on (1) repetition, (2) a gradual and easy transition from sight to touch typing, (3) initial emphasis on stroking speed, not errors, (4) teaching for technique, and (5) rate of keyboard presentation.[11] (West, p. 2)

Students are expected to key information quickly and accurately. They should learn and understand basic information processing vocabulary as well as concepts used in inputting and retrieving information. Students should become more confident on the microcomputer and its many applications. Learning the terminology of information processing and developing a touch skill on the microcomputer keyboard contribute to their computer literacy.

The practice material used should provide ample practice on numbers, special characters, and control characters as well as alphabetic characters. Practice copy should be similar to the material they will input after developing their keyboarding skill.

Summary

The integration of communications, data processing, records management, and word processing equipment provides one basic keyboard for input. The functions of these four systems are performed through the use of keyboarding skills. Students preparing for employment, where one or more of these systems may be used, must have a keyboarding skill.

Those who do not find the need for a keyboarding skill for employment will find this skill personally useful. Home computers are becoming increasingly popular. Eventually people will select and order groceries via computer and "read" the daily newspaper simply by keyboarding the appropriate codes. Every student will find a variety of applications for an efficient skill on the keyboard.

The challenge for business teachers, administrators, guidance counselors, and board of education members is to provide students with a basic education for today's and tomorrow's technical world. This challenge extends beyond a knowledge of machinery to an understanding that employers need eager-to-learn, responsible, and flexible personnel who have good keyboarding and communication skills.

[1]Robert N. Hanson and D. Sue Rigby, Keyboarding for Information Processing, (New York: McGraw-Hill, 1981, p. iv).

[2]James E. La Barre, et al., Keyboarding for Information Processors, (Chicago: Science Research Associates, 1982, p. iv).

[3]Hanson and Rigby, p. v.

[4]Alan M. Hofmeister, "Microcomputers in Perspective," Exceptional Children, Vol. 49, No. 2, (Oct. 1982: p. 116).

[5]"Some Call It Greed," Learning Corporation of America, 1979 - Film.

[6]Patsy A. Dickey-Olson, "Keyboarding," Balance Sheet, Vol. 63, No. 2, (Nov. 1981): p. 92.

[7]Jerry W. Robinson, et al., Typewriting: Learning and Instruction, Cincinnati: South-Western Publishing Co., 1979, p. 13.

[8]Gary N. McLearn, "Teaching Typewriting, Delta Pi Epsilon Rapid Reader No. 3, 1978, p. 6.

[9]Robinson, p. 57.

[10]Robinson, p. 18.

[11]Leonard J. West, "Principles and Procedures for Teaching Typewriting," Monograph 1, (New York: Harcourt, Brace, Jovanovich, 1979, p. 2.)

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